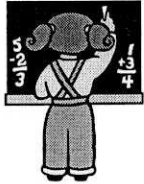


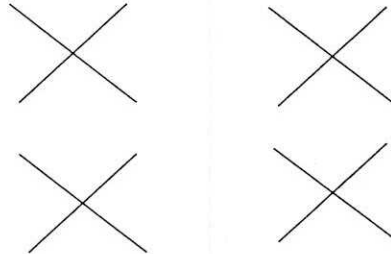


## Making “Sense” of Numbers

Shirley Roath  
Coordinator



## Warm Up!



## Warm Up!

$2 + 5 =$	$24 \div 4 =$
$2 \cdot 5 =$	$6 \cdot 4 =$
$7 - 4 =$	$8 + 9 =$
$4 \cdot 7 =$	$72 \div 9 =$

*“No matter how lucidly  
and patiently teachers  
explain to their students  
they cannot understand for  
their students.”*

*Shifter & Fosnot*

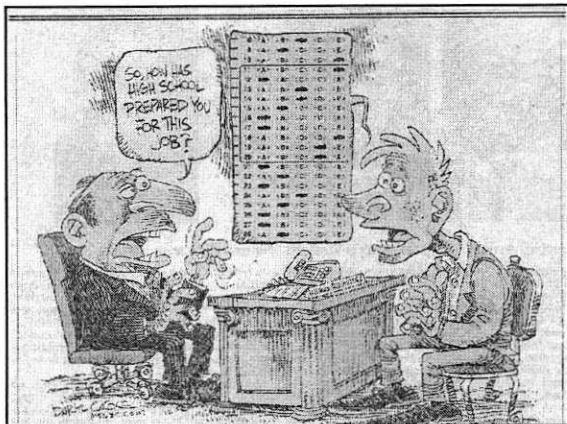
## Higher Order Thinking Skills

- Arithmetic is doing something to numbers to get an answer.
- Algebra is exploring the relationships between numbers.

## Top 10 Jobs

From a list of 200 best and worst jobs ranked by level of stress, work environment, physical demands, pay and career outlook. (Careercast.com, Jan. 2009)

1. Mathematician
2. Actuary
3. Statistician
4. Biologist
5. Software engineer
6. Computer systems analyst
7. Historian
8. Sociologist
9. Industrial design
10. Accountant



"The depressing thing about arithmetic badly taught is that it destroys a child's intellect and, to some extent, his integrity. Before they are taught arithmetic, children will not give their assent to utter nonsense; afterwards they will. Instead of looking at things and thinking about them, they will make wild guesses in the hopes of pleasing a teacher. The essential quality for a Mathematician is the habit of thinking things out for oneself. That habit is usually acquired in childhood. It is hard to acquire later."

--- W. W. Sawyer



### The "Algebraic" Solution

Materials for the current adoption were written with 8th grade Algebra 1 as the normal course of study. Students should be prepared *if Algebraic reasoning has been appropriately emphasized beginning in Kindergarten and if interventions are in place.*

### Algebraic Thinking Begins in Kindergarten

$$7 + 4 = \underline{\quad} + 3$$

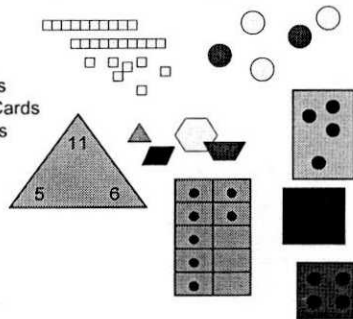
$$159 + 24 = \underline{\quad} + 29$$

$$3x - 2 = 3$$

$$8 + 7 = 10 + 5 = 15$$

### Algebraic Thinking in Primary

Dot Cards  
Ten Frames  
Base Ten Blocks  
Triangle Flash Cards  
Hundreds Charts  
Pattern Blocks  
Number Lines  
Unifix Cubes  
Color Tiles  
Dice



### Spatial Relationships



Five as a Learned Pattern.



Six as 3 and 3

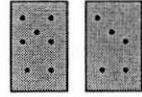


Seven as 6 and 1 more

## Activities to Encourage Spatial Recognition and Early Addition/Subtraction Concepts

Dot Plate Flash  
Dot Index Cards  
Toss the Die  
Dominoes  
5 and 10 Frames  
Assorted Dot Cards

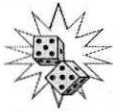
## Dot Plate Flash & Dot Index Cards



**Directions:** Hold up a dot plate for only 1 to 3 seconds. "How many did you see? How did you see it?" Children like to see how quickly they can recognize and say how many dots. Include lots of easy patterns and a few with more dots as you build their confidence. Students can also flash the dot plates or cards to each other as a workstation activity.

**Observe:** Which patterns were easier/harder? How did students group the dots (do they always tend to use one number)?

**Discussion Ideas/Possible Questions to Ask:** "How many did you see? How did you see it?"



## Toss the Die & Dominoes

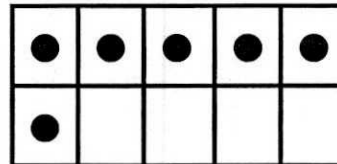


**Directions:** Let children play dominoes in the regular way, matching up the ends. As a speed activity, spread out all of the dominoes and see how fast the children play all of the dominoes or play until no more can be played. You can make your own "dot pattern" dominoes, to expose students to new patterns.

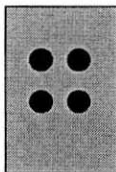
**Observe:** do students recognize that different patterns can have the same number of dots?

**Extension: One - Less Than dominoes:** Play in the usual way but instead of matching ends, a new domino can be added if it has an end that is one less than the end on the board. A similar game can be played for two less, one more or two more.

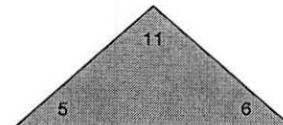
## 5 and 10 Frames



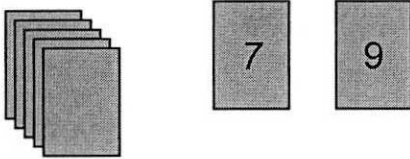
## One More One Less Two More Two Less



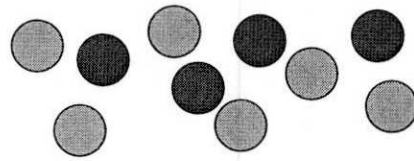
## Number Fact Necklaces



## Mind Games



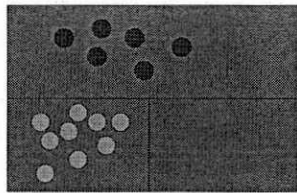
## Two Color Toss



Facts to 10

## Pick a Part

$$9 + \_ = 15$$



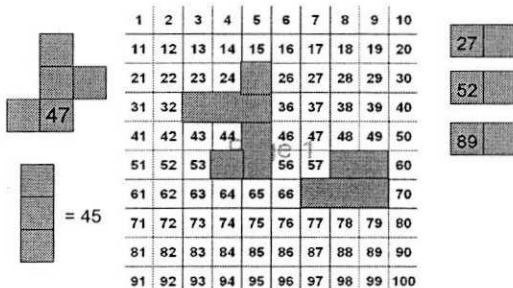
## Developing Students' Understanding

*Model increasing and decreasing on a number line.*



Paper Bag Number Lines  
Sentence Strip Number Lines (Vertical and Horizontal)  
Accordion Fold Number Lines

## Beginning Activities on the 100's Chart



Shirley Roath  
Mathematics Coordinator  
Sroath@rcoe.us

**Thank You!**